

Periodic substorms–sawtooth oscillations and their contribution to the ring current.

F.-A. Metallinou^{1,3}, T.E. Moore², M.-C. Fok², I.A. Daglis³, D. Delcourt⁴

1. Department of Physics, Aristotle University of Thessaloniki, GR-541 24 Thessaloniki, Greece

2. Laboratory for Geospace Physics, NASA Goddard SFC, Greenbelt, MD, USA

3. Institute for Space Applications, National Observatory of Athens, GR-152 36 Penteli, Greece

4. Centre d'étude des Environnements Terrestre et Planétaires, Saint-Maur des Fossés, France

Periodic substorm occurrences or sawtooth oscillations have been noted in the measurements of the energetic particle fluxes, by geosynchronous satellites. Observations have led to statistical characterization of these events, which have a mean period of about 120 min. In this study we simulate periodic substorms or sawtooth oscillations, under storm-time conditions, by using a three-dimensional dynamic ion-tracing model. We follow the transport and acceleration of plasma sheet ions, under the influence of a “background” convection electric field with superposed periodic impulsive electric fields due to magnetic field dipolarizations, as observed by spacecraft during substorm expansions. Our aim is to evaluate the contribution of periodic substorms and sawtooth events to the build-up of high pressure ring current plasmas in the inner magnetosphere. The relative influence of plasma sheet O^+ and H^+ ions has been examined. Initial results suggest that multiple periodic substorms have a cumulative effect on the ring current development.